

What is claimed is:

1. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the steps of:

supplying the fuel gas to the fuel cell and opening the purge valve so that the nitrogen gas that originates in the air and is present in the fuel gas circulation path is replaced by the fuel gas; and

closing the purge valve after the nitrogen gas in the fuel gas circulation path has been replaced by the fuel gas.

2. A start-up method for a fuel cell system according to claim 1, wherein the timing of the closing of the purge valve is determined depending on the duration of the fuel cell stoppage.

3. A start-up method for a fuel cell system according to claim 2, wherein the duration of the fuel cell stoppage is estimated based on the temperature of the fuel cell.

4. A start-up method for a fuel cell according to claim 2, wherein the duration of the fuel cell stoppage is estimated based on the voltage of the fuel cell.

5. A start-up method of a fuel cell system according to claim 1, wherein the timing of the closing of the purge valve is determined depending on the concentration of the fuel gas included in the discharge gas from the fuel gas circulation path.

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6. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the steps of:

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starting the supply of the fuel gas to the fuel cell;

opening the purge valve after the supplying the fuel gas starts for only a time

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determined depending on the estimated duration of the fuel cell stoppage; and

closing the purge valve.

7. A start-up method for a fuel cell system according to claim 6, wherein the estimated duration of the fuel cell stoppage is estimated based on the temperature of the fuel cell.

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8. A start-up method for a fuel cell system according to claim 6, wherein the estimated duration of the fuel cell stoppage is estimated based on the voltage of the fuel cell.

9. A start-up method for a fuel cell system according to claim 6, further comprising the step of:

starting power generation of the fuel cell after the closing of the purge valve.

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10. A start-up method for a fuel cell system according to claim 6, wherein the timing of the closing of the purge valve is determined depending on the pressure in the fuel gas circulation path and the voltage of the fuel cell.

10 11. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to  
15 discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the steps of:

starting the supply of the fuel gas to the fuel cell;

opening the purge valve after the start of the supplying of the fuel gas; and

closing the purge valve depending on concentration of the fuel gas included in the

20 discharge gas from the fuel gas circulation path.

12. A start-up method for a fuel cell system according to claim 11, further comprising the step of:

starting the power generation of the fuel cell after the closing of the purge valve.

13. A start-up method for a fuel cell system according to claim 11, wherein the timing of the closing of the purge valve is determined depending on the pressure in the fuel gas circulation path or the voltage of the fuel cell.

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14. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the steps of:

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supplying the fuel gas to the fuel cell;

measuring the pressure in the fuel gas circulation path while the supplying of the

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fuel gas is in progress; and

setting an opening start timing of the purge valve depending on the measured value of the pressure.

15. A start-up method of a fuel cell system according to claim 14, further comprising the steps of:

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opening the purge valve after the opening start timing of the purge valve; and

closing the purge valve after the nitrogen gas that originates in the air and is present in the fuel gas circulation path has been replaced by the fuel gas.

16. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the steps of:

supplying the fuel gas to the fuel cell;

measuring the pressure in the fuel gas circulation path while the supplying of the

fuel cell is in progress;

determining whether the measured value of the pressure is equal to or greater than a predetermined value; and

opening the purge valve when the measured value of the pressure becomes equal to or greater than a predetermined value.

17. A start-up method for a fuel cell system according to claim 16, further comprising the step of:

closing the purge valve after the nitrogen gas that originates in the air and is present in the fuel gas circulation path has been replaced by the fuel gas after the opening of the purge valve.

18. A start-up method for a fuel cell system that includes a fuel cell that carries out power generation by the electrochemical reaction between a fuel gas and the oxygen gas in the air; a fuel gas discharge path and a fuel gas supply path that are connected to the fuel

cell; a fuel gas circulation path that connects the fuel gas discharge path to the fuel gas supply path; and a purge valve provided on the fuel gas circulation path in order to discharge the circulating fuel gas from the fuel gas circulation path, the method comprising the step of:

- 5            setting the timing of the opening and closing of the purge valve depending on the estimated duration of the fuel cell stoppage.